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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,210	01/29/2004	Yong-Kwan Lee	2557-000202/US	3354
7590 07/20/2005 HARNESS, DICKEY & PIERCE, P.L.C. P.O. Box 8910 Reston, VA 20195			EXAMINER HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 07/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/766,210	LEE ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tu-Tu Ho	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-4,6,8,16 and 31-33 is/are pending in the application.
- 4a) Of the above claim(s) 6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,8,16 and 31-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>04/08/2005</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. Applicant's arguments with respect to amended claims 1-4, 8, 16, and 31-33, filed 05/18/2005, have been considered but they are moot in view of new ground(s) of rejection.

#### *Drawings*

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "the groove is not formed through the cap" of **claim 33** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will

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be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**3. Claims 1-2, 4, 16, and 31-33** are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshikawa JP 10-242355 (cited by Applicant, and hereinafter referred to as the '355 reference).

The '355 reference discloses in the figures, particularly Fig. 2(b) and respective portions of the specification a flip-chip package as claimed.

Referring to **claim 1**, the reference discloses a flip-chip package comprising:

a semiconductor chip (3) having a first side and a second side opposing the first side;

a circuit substrate (4) electrically connected to the first side of the semiconductor chip;

a protective cap (1) disposed over the second side of the semiconductor chip, the

protective cap including at least one portion extending beyond an edge of the semiconductor chip, the portion including a groove having a fan-shaped cross-section such that a part of the

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groove further from the second side of the semiconductor chip is wider in cross-section than a part of the groove closer to the second side of the semiconductor chip; and

a molding resin layer (2) sealing the electrical connection between the semiconductor chip and the circuit substrate and filling the fan-shaped groove in the cap.

Referring to **claim 2**, the protective cap includes metal as it is a heat sink.

Referring to **claim 4**, the reference further discloses a plurality of solders (6) to electrically connect the semiconductor chip and the circuit substrate, for the device to function.

Referring to **claim 16**, the reference further discloses solder balls (5) formed on a surface of the circuit substrate opposite a surface to which the circuit substrate is electrically connected to the semiconductor chip.

Referring to **claim 31**, the reference further discloses that the protective cap includes more than one portion extending beyond an edge of the semiconductor chip, and each portion includes a groove having a fan-shaped cross-section; and that the molding resin layer fills each groove.

Referring to **claim 32**, the reference further discloses that the groove is formed through the protective cap (Fig. 2b).

Referring to **claim 33**, the reference further discloses that the groove is not formed through the cap (Fig. 5).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1-4, 8, 16, and 31-33** are rejected under 35 U.S.C. §103(a) as being unpatentable over Caletka et al. U.S. Patent 6,507,116 (the '116 reference, cited in a previous office action) in view of Yoshikawa JP 10-242355 (cited by Applicant, and hereinafter referred to as the '355 reference).

The '116 reference discloses in Fig. 4 and other figures, with the other figures showing the elementary components in more details, and respective portion of the specification a flip chip package substantially as claimed.

Referring to **claim 1**, the reference discloses a flip chip package comprising:

a semiconductor chip (no number, whose side surface is indicated as 220) having a first side and a second side opposing the first side;

a circuit substrate ("circuitized substrate", indicated as 16 in Fig. 1, as 216 in Fig. 4) electrically connected to the first side of the semiconductor chip;

a protective cap ("thermally conductive member" 222, Fig. 4, column 6, lines 31-47, and note that although the reference does not explicitly disclose that element 222 is a protective cap, it is a protective cap as it protects the chip from the environmental elements) disposed over the second side of the semiconductor chip, the protective cap including at least one portion extending beyond an edge of the semiconductor chip (as is evident from the figures), the portion including a groove ("opening" 229); and

a molding resin layer (226) sealing the electrical connection between the semiconductor chip and the circuit substrate and filling the groove in the cap.

However, the reference fails to teach that the groove has a fan-shaped cross-section such that a part of the groove further from the second side of the semiconductor chip is wider in cross-section than a part of the groove closer to the second side of the semiconductor chip.

Yoshikawa, in also disclosing a flip chip package as detailed above including groove (1B, 1D, Figs. 2's and 5) having a fan-shaped cross-section such that a part of the groove further from the second side of the semiconductor chip is wider in cross-section than a part of the groove closer to the second side of the semiconductor chip and/or a hook structure 1A, appears to teach that such a modification reduces peeling off and crack generation of sealing resin boundary surface due to thermal expansion ("ADVANTAGE", Derwent Publication of the Yoshikawa reference).

Therefore, it would have been obvious to form the '116 reference's device such that the groove 229 has a fan-shaped cross-section such that a part of the groove further from the second side of the semiconductor chip is wider in cross-section than a part of the groove closer to the second side of the semiconductor chip. One would have been motivated to make such a change in view of the teachings in Yoshikawa that such a change might reduce peeling off and crack generation of sealing resin boundary surface due to thermal expansion.

Referring to **claims 2-3**, the '116 reference further discloses that the thermally conductive protective cap 222, similar to the thermally conductive protective cap 22, includes metal and is made of one selected from the group consisting of copper (Cu), copper alloy, aluminum (Al), and aluminum alloy (column 5, lines 5-10).

Referring to **claim 4**, the '116 reference further discloses a plurality of solders (214) to electrically connect the semiconductor chip and the circuit substrate.

Referring to **claim 8**, the '116 reference further discloses an adhesion layer (part of resin 226, with "adhesion layer" being interpreted broadly) disposed between the second side of the semiconductor chip and the protective cap (223).

Referring to **claim 16**, the '116 reference further discloses solder balls (not shown in the circuit substrate 216 of Fig. 4, shown as balls at a lower surface of the circuit substrate 16 of Fig. 1) formed on a surface of the circuit substrate opposite a surface to which the circuit substrate is electrically connected to the semiconductor chip.

Referring to **claim 31**, the '355 reference further discloses that the protective cap includes more than one portion extending beyond an edge of the semiconductor chip, and each portion includes a groove having a fan-shaped cross-section; and that the molding resin layer fills each groove.

Referring to **claim 32**, both the references further disclose that the groove is formed through the protective cap (groove 229 in Fig. 4, the '116 reference; groove 1B in Fig. 2b, the '355 reference).

Referring to **claim 33**, the '335 reference further discloses that the groove (1D) is not formed through the cap (Fig. 5).

### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. See MPEP § 706.07(a).

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho  
July 13, 2005